

REMARKS

Claims 1-4, 6, 7, and 9-14 are pending. Claims 1-4 and 9 have been amended. Reconsideration and allowance of the present application based on the following remarks are respectfully requested.

Claim Rejections Under 35 U.S.C. § 102

Claims 1 and 9 were rejected under 35 U.S.C. § 102(e) over Tsou et al. (U.S. Patent No. 6,509,219). Applicant respectfully traverses this rejection.

Amended, claim 1 recites, in part, a method of forming a metal line layer in a semiconductor device including depositing a diffusion barrier layer, a metal layer and an anti reflection layer on a semiconductor substrate, etching portions of the insulating film, the anti reflection layer and the metal layer using activated plasma and the photosensitive material as a mask, whereby portions of side walls of the metal layer are over-etched by plasma ions, and forming a side wall oxide film on the over-etched side walls of the metal layer by reacting the metal layer with ozone.

In contrast, Tsou merely discloses the formation of a metal line layer 14 having a plurality of conductive layers (See, for example, column 4, lines 21-53). Tsou further discloses the formation of a passivating layer 24 on substantially vertical sidewalls 22 and the horizontal surface of the thinned conductive layer 15 (See, for example, column 4 lines 7-15 and Figure 4) and the etching of the passivating layer 24 formed on the horizontal surface of the thinned conductive layer 15 using the passivating layer 24 formed on the vertical sidewalls 22 as an etch mask (See, for example, Figure 5). However, Tsou does not teach or suggest that the portions of side walls of the metal layer are over-etched by plasma ions or the forming of a side wall oxide film on the over-etched side walls of the metal layer by reacting the metal layer with ozone. Accordingly, Tsou fails to teach, or even suggest, a method of forming a metal line layer in a semiconductor device including depositing a diffusion barrier layer, a metal layer and an anti reflection layer on a semiconductor substrate, etching portions of the insulating film, the anti reflection layer and the metal layer using activated plasma and the photosensitive material as a mask, whereby portions of side walls of the metal layer are over-etched by plasma ions, and forming a side wall oxide film on the over-etched side walls of the metal layer by reacting the metal layer with ozone, as recited in amended claim 1.

Amended claim 9 recites, in part, a method of forming a metal line layer in a semiconductor device including etching portions of the insulating film, the anti reflection layer

and the metal layer using activated plasma and the photosensitive material as a mask, whereby portions of side walls of the metal layer are over-etched by plasma ions and forming a side wall oxide film on the over-etched side walls of the metal layer by reacting the metal layer with ozone.

In contrast, Tsou discloses etching one conductive layer of the plurality of conductive layers (See, for example, Figure 3). Tsou further discloses the formation of a passivating layer 24 on the substantially vertical sidewalls 22 and the horizontal surface of the thinned conductive layer 15 (See, for example, column 4, lines 7-15 and Figure 4) and the etching of the passivating layer 24 formed on the horizontal surface of thinned conductive layer 15 using the passivating layer 24 formed on the vertical sidewalls 22 as an etch mask (See, for example, Figure 5). Tsou et al. does not teach or suggest forming a side wall oxide film on the over-etched side walls of the metal layer by reacting the metal layer with ozone.

Accordingly, Tsou fails to teach, or even suggest, a method of forming a metal line layer in a semiconductor device including etching portions of the insulating film, the anti reflection layer and the metal layer using activated plasma and the photosensitive material as a mask, whereby portions of side walls of the metal layer are over-etched by plasma ions and forming a side wall oxide film on the over-etched side walls of the metal layer by reacting the metal layer with ozone, as recited in amended claim 9.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of this rejection.

Claim Rejections Under 35 U.S.C. § 103

A. Claims 1, 2, 6, 7, and 9-14 were rejected under 35 U.S.C. § 103(a) over Lyons et al. (U.S. Patent No. 6,214,737) in view of Brown et al. (U.S. Patent No. 6,541,320) and further in view of Lo (U.S. Patent No. 5,726,102). Applicant respectfully traverses this rejection.

As discussed above, claim 1 is generally directed to a method of forming a metal line layer in a semiconductor device including depositing a diffusion barrier layer, a metal layer and an anti reflection layer on a semiconductor substrate, etching portions of the insulating film, the anti reflection layer and the metal layer using activated plasma and the photosensitive material as a mask, whereby portions of side walls of the metal layer are over-etched by plasma ions, and forming a side wall oxide film only on the side walls of the metal layer by reacting the metal layer with ozone. Additionally, claim 9 recites etching portions of the insulating film, the anti reflection layer and the metal layer using activated plasma and the photosensitive material as a mask, whereby portions of side walls of the

metal layer are over-etched by plasma ions and forming a side wall oxide film on the over-etched side walls of the metal layer by reacting the metal layer with ozone.

In contrast, Lyons merely discloses the formation of a metal line layer 12 having a plurality of conductive layers (See, for example, column 3, lines 10-35). Lyons further discloses the deposition a sidewall film 18 over the polysilicon conductive film 12 (See, for example, column 7 line 66 to column 8, line 9). Lyons et al. does not teach or suggest the forming of a side wall oxide film only on the over-etched side walls of the metal layer by reacting the metal layer with ozone or that the portions of side walls of the metal layer are over-etched by plasma ions.

Additionally, Lyons discloses etching one conductive layer of the plurality of conductive layers (See, for example, Figure 2) and depositing a sidewall film 18 over the polysilicon conductive film 12 (column 7 line 66 to column 8, line 9). Lyons does not teach or suggest the step of forming a side wall oxide film on the over-etched side walls of the metal layer by reacting the metal layer with ozone.

No combination of Brown and Lo remedy the deficiencies of Lyon discussed above. Accordingly, no combination of Lyons, Brown and Lo teach or suggest at least the features of claims 1 and 9 discussed above.

Claims 2, 6, 7, and 10-14 are believed allowable for at least the reasons presented above with respect to claims 1 and 9 by virtue of their dependence upon claims 1 and 9. Accordingly, Applicant respectfully requests reconsideration and withdrawal of this rejection.

B. Claims 3, 4, 10, 11, and 14 were rejected under 35 U.S.C. § 103(a) over Lyons in view of Brown and Lo and further in view of Takada et al. (U.S. Patent No. 5,350,563) and claims 2-4, 6, 7, 12, and 13 were rejected under 35 U.S.C. § 103(a) over Tsou in view of Lo and further in view of Takada. Applicant respectfully traverses these rejections.

Claims 2-4, 6, 7, and 10-14 are believed allowable for at least the same reasons presented above with respect to claims 1 and 9 by virtue of their dependence upon claims 1 and 9 and because Takada fails to remedy the deficiencies of Tsou, Lyon, Brown, and Lo discussed above with respect to claims 1 and 9.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of these rejections.

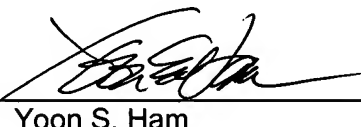
Conclusion

Therefore, all objections and rejections having been addressed, it is respectfully submitted that the present application is in a condition for allowance and a Notice to that effect is earnestly solicited.

Should any issues remain unresolved, the Examiner is encouraged to contact the undersigned attorney for Applicants at the telephone number indicated below in order to expeditiously resolve any remaining issues.

Respectfully submitted,

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